

LE MATEMATICHE

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## PRAGMATIC

The subsequent papers are based on results obtained during or in the sequel of the Pragmatic School 2008. The school was held from July 14 till August 1, 2009 on the campus of the University of Catania. It was devoted to combinatorial aspects of commutative algebra under the title:

### FREE RESOLUTIONS AND HILBERT SERIES: ALGEBRAIC, COMBINATORIAL AND GEOMETRIC ASPECTS

The scientific program was guided by Jürgen Herzog (Universität Duisburg-Essen) and Volkmar Welker (Philipps-Universität Marburg). The two main lecturers were assisted by Marius Vladoiu (University of Bucharest), Eran Nevo (Cornell University) and Xinxian Zheng (Universität Duisburg-Essen).

The school was attended by 20 advanced graduate students and young post-docs from all over Europe.

During the first week each of the main lectures presented a two hours talk each morning. In the afternoon the participants worked on the problem sets from the morning lectures and presented their solutions. The following topics were covered by the lectures:

- Free Resolutions
- Hilbert series
- Resolutions of powers of ideals
- Kruskal-Katona and Macaulay Theorems
- Koszul algebras
- Edge ideals

- Real rooted polynomials
- Vertex cover algebras
- The Neggers-Stanley conjecture and Koszul algebras
- Stanley depth
- Lefschetz algebras

After the first week the students selected research problems from a long list that had been posed during the lectures. In the second week additional lectures were given to support the emerging research activities. Marius Vladioiu, Eran Nevo and Xinxian Zheng outlined the state of the art in the fields of Stanley depth, algebraic shifting and edge ideals. In addition the two main lecturers promoted the research activities by lectures on refining the topics from the first week. The main focus shifted from learning to producing mathematics. This process culminated in first results and germs of results at the beginning of the third week. The school was closed by a day of presentation of results.

As the main lecturers we were overwhelmed by the enthusiasm of the participants, their endurance and their creativity. The results of these efforts already became visible during the presentations at the last day of the school. In addition, the participants continued their fruitful efforts in the subsequent weeks and months. Therefore, it came as no surprise when a call for papers containing the results achieved as a sequel of Pragmatic was responded by the submission of eleven high quality manuscripts. The advances described in the papers have substantially contributed to the research in the respective topics and have found international attention.

As the main lecturers we are impressed by the results obtained by this group of highly talented and hard working young mathematicians. We are also impressed by the perfect organization of the school. Among the many people in Catania whose endless efforts have contributed to this perfection we specifically would like to express our gratitude to Alfio Ragusa and Giuseppe Zappalà. Last but not least it has been a pleasure to work and teach together with Marius Vladioiu, Eran Nevo and Xinxian Zheng whose enduring efforts have significantly contributed to the success of the school.

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